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GIRDLING OF LODGEPOLE PINE AS A TEST OF ARTIFICIAL BARK BEETLE CONTROL

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GIRDLING OF LODGEPOLE PINE AS A TEST

OF

ARTIFICIAL BARK BEETLE CONTROL

The girdling as a means of barkbeetle control experiment was instituted in the Missoula National Forest at Phillipsburg, Montana, during the summer of 1924. The purpose of this experiment was to determine if trees infested by barkbeetles could be treated in such a manner that they would dry out with sufficient rapidity as to destroy the developing broods of insects. Four methods of treatment were used in this experiment which were as follows: a hack girdle, a peeled strip 18 inches wide, a notch through the sapwood girdle, and felling. A sketch is attached to this report which more clearly describes these methods. An attempt was made to lodge several of the trees felled but for the most part these were brought to the ground by the winter snows.

This work was started in August at which time a total of 40 trees, 10 of each class, were treated. In September, one month later, another set of 40 trees were treated in the same manner. At the time this work was started the attack was not more than five to seven days old. Egg galleries were being constructed at the bottom of which oviposition had occurred. In September the eggs with a very few exceptions had all hatched and the larvae had started feeding.

At the time the second set of trees were established those treated during the month of August were examined by the writer. At that time no

difference could be noticed in the brood development between the girdled and the untreated trees adjacent. However with those which had been felled with the bole exposed to the sun the brood development along the south side had been stopped. Though eggs had been laid in these trees, perhaps prior to the treating, they are not believed to have hatched or if they did the resulting larvae died without feeding.

With one tree "C-3", where the broods had not developed along the south side of the upper portion of the log, the infested length of the bole was cut off and turned with the bottom side up. You will note from the charts attached that at the time of the July examination there were no insects in this log whatever, which was the only tree treated by the "C" method where this result was accomplished. Tree "C-17" shows no broods but you will note that the attack was unsuccessful. This one tree can hardly be taken as proof that this additional treatment was the cause for the results obtained, but if so the possibilities of this method of control for a certain class of infestations appears promising.

On June 24th, 1925, these trees were examined by Mr. Gibson and the writer and on July 2nd a subsequent examination was made by the latter. No doubt these examinations could have been more intensive, however the results which were obtained were so evident that it was not deemed necessary. In addition to those treated twenty-six (26) test or check trees were also examined. These trees were selected indiscriminately their location being the only factor considered.

The following table lists some of the more important points of the charts attached to this report:-

SUMMARY TABLE OF CHARTS

	"A" Test Trees	"A" Trees	"B" Trees	"C" (x) Trees Top ½	"C" (x) Trees Bot. ½	"D" Trees
Per cent of trees with broods on north side	15.3	-	35.0			33.3
Per cent of trees with broods but not on south side	42.3	35.0	40.0			66.6
Per cent of trees with broods on all sides	26.9	50.0	45.0			22.2
Per cent of trees with broods of less than 25 insects per sq. foot.	34.6	10.0	55.0	10.0	00.0	22.2
Per cent of trees with broods of more than 25 insects per sq. foot.	34.6	75.0	35.	10.0	90.0	66.6
Per cent of trees with no broods	30.7	15.0	10.0	80.0	10.0	11.0
Per cent of trees with woodpecker work	57.6	40.0	20.	-	-	23.8
Average per cent of bark removed by woodpeckers from the trees attacked	41.3	46.6	40.	-	-	44.
Per cent of trees with foliage all green	30.7	26.3	35.			44.4
Per cent of trees with green and discolored foliage	23.0	42.1	30.0			27.7
Per cent of trees with foliage all discolored	46.1	31.5	35.0			27.7

(x) Of the "C" trees the broods in ten of them are in an unhealthy, abnormal condition, and there is little question as to the emergence being very light.

There was no external difference in the dryness between the girdled and the untreated trees adjacent, however there is no doubt but that a laboratory analysis would show some difference. Apparently the drying out of standing trees has but little effect upon brood development if the larvae are given an opportunity to start feeding during the summer, and apparently the treated trees did not dry with sufficient rapidity to prevent it. This point was checked during the summer, many trees being examined which were apparently in a maximum state of dryness but yet containing healthy broods of emerging insects.

The results obtained from the "C" trees show a greater possibility and it may be found that a modification of this method would be feasible to adopt. You will note from the summary table that of the 20 trees treated in this manner the broods of ten were in an unhealthy condition and it is reasonably safe to say that very little emergence would occur. This condition was brought about by two extremes which were the dryness of the upper half of the log and the dampness, or excess moisture in the lower portion. A more detailed test of this method was instituted in the Bitterroot Forest during the summer of 1925. The purpose of this test was not to bring about a rapid drying of the bole but to attempt to secure a maximum moisture content of the infested trees.

As a general rule the broods were heavier below the girdle than above, which is a condition one would expect to find. Due to the extra thickness of the bark and the protection from woodpeckers afforded by the snow level, there are nearly always heavy broods at the extreme base of

the trees. The girdling is not believed to have had any effect upon the difference in the broods above and below the girdle.

It would seem that if the girdling actually resulted in a more rapid drying out of the tree there would be a greater foliage discoloration than with those untreated. On the contrary there was no advanced foliage fading of these trees, in fact the untreated test trees showed a greater discoloration than those treated.

The test trees showed a larger per cent of trees hit by woodpeckers than the treated ones, however the average per cent of bark removed from the trees attacked was perhaps a trifle higher on those girdled.

In summarizing these notes it is evident that the girdling had little if any effect upon the insect brood mortality. However the trees which were felled showed more promising results and it is believed that some modification of this method may prove successful in controlling certain classes of infestation. Contingent upon the outcome of the experimental work instituted in the Bitterroot Forest last season, it is believed that further work should be conducted along this line.

Respectfully submitted,

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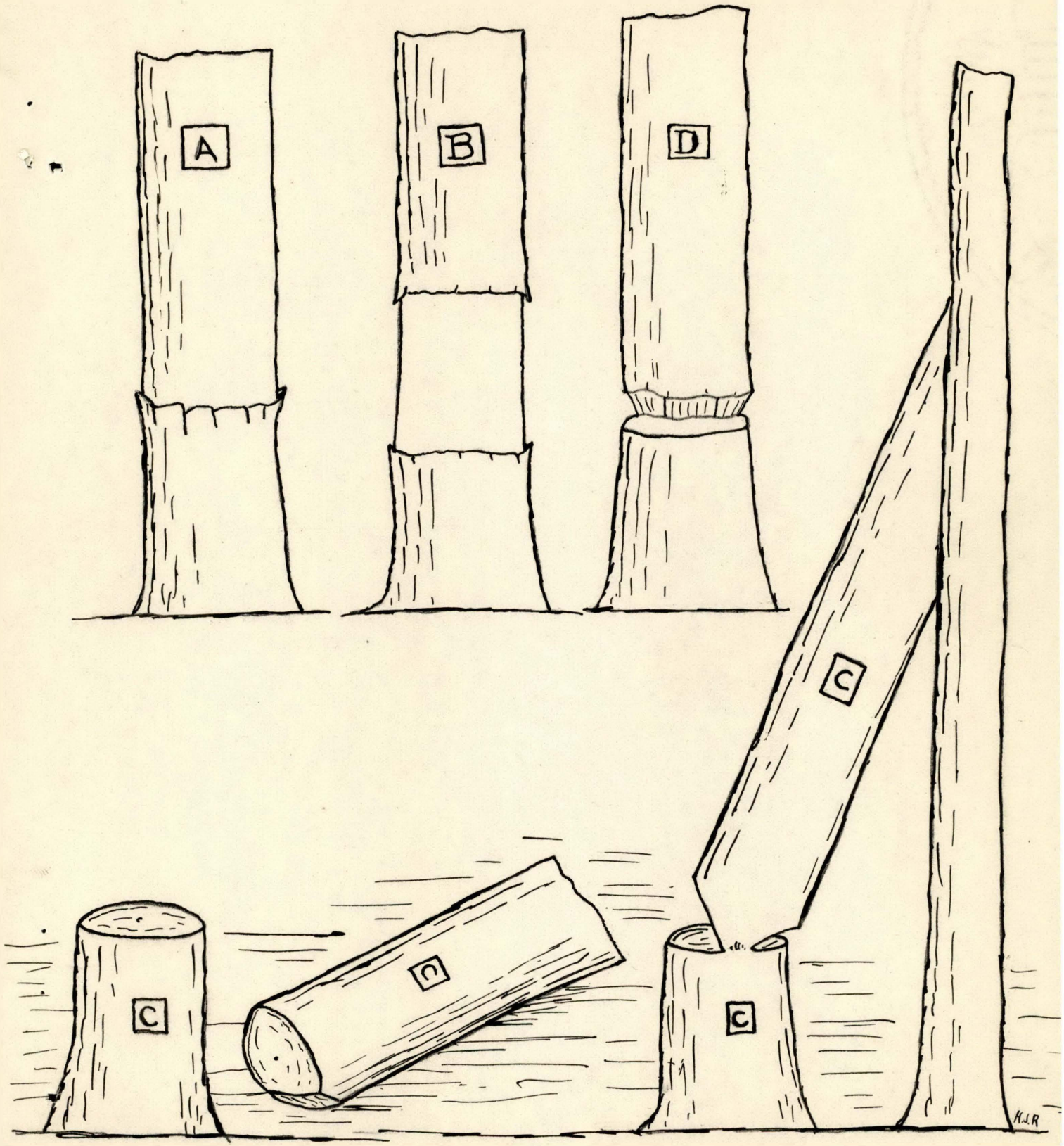
A
B
D
C
C
D
C

LEGENDS

Due to the amount of data which it was necessary to include on these charts it became necessary to adopt certain symbols in order that there would be sufficient space. The following is a key to the legends used:

BARK COLUMN

T- Thin
M- Medium
Th- Thick
-T Tight
-L Loose

FOLIAGE COLUMN

G - Green
F - Fading
S - Sorrel
R - Red
Figures-Per cents

WOODPECKER WORK COLUMN

x - 20% of infested bark removed
xx - 40% " " " "
xxx - 60% " " " "

STATUS OF BROOD DEVELOPMENT

L - Larvae
ML - Mature larvae
P - Pupae
NA - New Adults

EXPOSURE CONTAINING BROODS COLUMN

N.E.S.W. & Directions
- - Heavy brood

REMARKS COLUMN

Gi - Girdle
B - Broods
P.O. - Pitched out
To - Top
Si - Sides

C - Cambium
Ba - Bark
Mo - Moist
VMo - Very moist

Test Trees

Test TREE NO.	DBH	BARK	FOLIAGE	Wood peckers WORK	STATUS of BROODS	Exp. Containing BROODS	REMARKS	BROODS	BROODS	FT.	REMARKS
			EXAMINATION OF JUNE 24, 1925					EXAMINATION OF JULY 2, 1925.			
1	12	M-T	G-75 F-15 S-10	xxx	ML-P	N.E.S.W.	Same as "C" trees	ML-P	N-W	25	S-E dried out. No broods.
2	18	T-T	G-90 F-10	xxx	ML-P	N.	S.E.W. ~~Too.~~ Few	None			Too dry.
3	8	T-T	G-100	-	ML-P	N.E.S.W.	Healthy.Heavy.	L-P,NA	N.E.S.W.	30	NA on south.
4	10	M-T	F-100	-	ML-P	N.E.S.W.	Normal healthy	ML-P	N.E.S.W.	20	Light broods.
5	10	M	G-100	-	ML-P	N.E.S.	Lightly attacked. No attack W.	P-NA	N.	8	Very few.
6	11	T	F-100	xxx	L-P	N.E.S.W.	Missed by Wps.	P-NA	All	20	Very dry.
7	8	T-T	F-100		L-P	N.E.S.W.	Dry and tight.	None	-	-	-
8	10	T	G-50 S-50	x10'	ML-P	N.E.W.	Tree dry.	None	-	-	Light emergence.
9	14	T	F-100	xx S	ML-P	N.E.W.	Tree dry.	NL-P NA	N.E.W.	45	Heavy on N. Tree dry.
10	10	T	G-100		ML-P	N.E.S.W.	Light attack at base	L-P	N.	Less: 20	Very few.
11	10	T	F-100	x S	L-P	Base 4'	Tree very dry.	P-NA	All	20	At base only.
12	16	M	G-100	x S	ML-P	N.E.S.W.	Infested 12'	NA	N.	20	Light emerg.on S.
13	12	M	F-100	xxxS	ML-P	N.W.E.	S-dried out	None	-	0	Few scattered.
14	12	M	F-100	xx S	L	N.E.S.W.	Few at base tree dry.	None			
15	12	M-T	S-100	xx	ML-P	N.E.S.W.	Base only below 6' heavy	P-NA	All	25	Basal 6' only.
16	12	T	G-100	xx	ML-P	N.E.S.W.	Infested at base only.	ML-P	N.E.S.W.	30	Few scattered on other sides. Base only.
17	14	T	F-100	-	ML-P	N.W.S.E.		ML-P NA	N.E.S.W.	30	Lightest on south side.
18	9	T-T	F-100	xx	L-P	N.W.E.	Tree dry. Very light broods	None			Tree very dry.
19	11	M	G-25 F-50 S-25	x	ML-P	N.W.S.E.	Tree very dry	P-NA	N.	30	Tree very dry
20	10	T-L	G-100	-	L-P	N.E.W.	P.O. on S.side.	L-P-NA	E.N.W.	10	Tree very dry.
21	10	M-L	F.S.R.	-	ML-P	N.W.S.E.		None			
22	13	M-L	G-90 F-10	-	ML-P	N.E.W.	S very dry. Heavy B.	L-P-NA	N.E.W.	25	Tree very dry.
23	10	M-L	G-100	-	ML-P	N.E.W.	Light attack.	None			
24	8	T-L	G-100		ML-P	N.E.W.	Few on S. Cambium moist.	L-P-NA	N.E.W.	25	None on south.
25	14	M-T	F-100	xxx	ML-P	N.E.W.	Few on south side	L-P	N.E.W.	20	Heavy woodpecker work.
26	11	T	G-Top F-Base	xx	ML-P	N.E.W.	Tree very dry	L-P	N.W.	8	Few scattering.

Tree No.	DBH	BARK	FOLIAGE	Wood peckers WORK	STATUS of BROODS	Exp. Containing BROODS	REMARKS	STATUS of BROODS	Exp. Containing BROODS	Ins. per sq. FT.	REMARKS
				EXAMINATION OF JUNE 24, 1925.				EXAMINATION OF JULY 2, 1925.			
A1	12	T		xxx	L-P	N.E.S.W.	P below girdle	ML-P	N.E.S.W.	50	Heavy brood
A2	10	M-L	G		ML-P	N.E.S.W.	Same below	ML-P-NA	N.E.S.W.	45-50	Infested on lower 8 feet.
A3	12	M-L	G		ML-P	N.E.S.W.	Same below	ML-P	N.E.W.	40	Light on E-W.
A4	8	M-T	F		ML-P	N.E.S.W.	Same below	P-NA	N.E.S.W.	15-20	Basal 6' attacked. Light.
A5	14	M-L	b-S.t-G		ML-P	N.E.S.W.	Infested to 24'	NA	N.E.S.W.	20	NA not healthy.
A6	9	M	F		ML-P	N.E.S.W.	Pupa below gird	ML-P	N.E.S.W.	30	Brood not healthy.
A7	12	M-L	S		ML-P	N.E.S.W.	S light attack	ML-P	N.E.S.W.	40	Brood normal.
A8	10	M-T	F		L-P	N.E.S.W.	P below girdle	ML-P	N.E.S.W.	35	Tree drier above girdle.
A9	14	T-T	S		L	N.E.S.W.		NA	N.E.S.W.	30	Normal.
A10	12	M-T	S		ML	N.E.S.W.	Very light att.	None	-	-	Few scattered ins.
A11	10	M-T	G-Top S-Base	xxx	L-P	Below girdle	Tree dry	None	-	-	Few scattered ins.
A12	10	M-L	G	xx	ML-P	N.E.W.	Heavy below G. Tree dry	ML-P	N.E.W.	30	Tree dry.
A13	13	M	G Fat base		ML-NA	N.E.S.W.	Heavy below girdle	ML-P	N.E.S.W.	40	South side dry.
A14	11	M-L	G-Top S-Base	xxx	L-P	N.E.W.	Heavy below girdle	L-P	N.E.W.	25	Tree dry.
A15	11	T	G-Top S-Base		ML-P	N.E.S.W.	Sambe below girdle	L-NA	N.E.S.W.	50	Few new adults
A16	11	M	G-S F at base	xx12'	ML-P	N.E.W.	Light brood Heavier below G.	None	-	-	Tree very dry.
A17	10	M-L	G-Top S-Base	xx	ML-P	N.E.W.	Very heavy attack. Light broods	ML-P	N.E.W.	25	Heavy X on S.
A18	11	M	G-Top S-Base	xxx12'	ML-P	N.E.W.	Light broods	ML-P	N.E.W.	30	Tree dry.
A19	9	M-L	G	x	L-P	N.E.W.	All sides below girdle.	L-P	N.E.W.	50	Tree very dry.
A20	13	M-L	F.S.	xx16'	L-P	N.E.S.W.	Heavy below G.	ML-P	N.W.	45	Few on S.E.

			EXAMINATION JUNE 24, 1925.					EXAMINATION JULY 2, 1925.			
TREE No.	DBH	BARK	FOLIAGE	Woodpeckers WORK	STATUS of BROODS	Exp. Containing BROODS	REMARKS	STATUS of BROODS	Exp. Containing BROODS	Ins Per Sq. FT.	REMARKS
B1	12	M-L	G-Top S-Base		L-P	N.	Light attack.	NA	N.	Few	Few scattered. emergence holes present.
B2	10	M-T	G-Top S-Base		L-P	N.E.S.W.	Light attack few feet above girdling only	ML-P	N.E.S.W.	20	Light brood
B3	12	M	G		L	N.E.S.W.	Light on S.	L-P	N.E.S.W.	20	Very few-scattered
B4	12	M	G-Top S-Base		L-P	N.E.S.W.	Light on S.	L-P	N.E.S.W.	20	Very few-scattered
B5	12	M	G-Top S-Base		ML-P	N.E.S.W.	Normal broods.	ML-P	N.E.S.W.	50	Normal broods.
B6	14	M	G		ML-P	N.E.S.W.	Tree Dry.Light B.	L-P	N.E.S.W.	15	Very dry.Light B.
B7	12	M	S		L-P	N.E.S.W.	Same below G.	NA	N.E.S.W.	15	Very dry.
B8	12	M	G		ML-P	N.E.S.W.	Same below G.	NA	N.	40	Tree very dry.
B9	12	M-T	G-Top S-Base		ML-P	N.E.S.W.	Fairly heavy attack	NA	N.	30	Very dry.
B10	11	M-L	G-Top S-Base		ML-P	N.E.S.W.	Heavy brood except on S.	NA	N.	40	Very dry.
B11	10	M	S	x	ML-P	N.E.S.W.	Fairly heavy br.	ML-NA	N.	50	Very few insects on other sides.
B12	12	M	S	xx	ML-P	N.E.W.	Light. Heavy br below girdle	ML-P	-	Few	Few scattered insects
B13	11	M	S		ML-P	N.E.W.	S-G light attack:	-		None	Tree lightly att.
B14	14	M-T	F	xxx	M-P	N.E.S.W.	Few insects.	ML-P	N.E.S.W.	Few	Few scattered.
B15	12	M-L	G		ML-P	N.E.S.W.	Very dry.	NA	N.W.	Few	Emergence holes.
B16	9	T	G		ML-P	E.S.W.	N-G light attack:	-	-	None	Light attack P.O.
B17	10	M	G		ML-P	N.E.W.	Few on S.	L-P	N	20	Maturing doubtful.
B18	11	M-L	F		ML-P	N.W.	Few on S base green	L-P	N.E.S.W.	25	
B19	11	T	F	xx	ML-P	N.E.S.W.		P-NA	N.E.S.W.	50	Active & healthy.
B20	10	M	G		LP	N.	Other sides green:	P	N.	Few	Light attack.

TREE:			JUNE 24. 1925. LOG					JULY 2. 1925 LOG				
			Top Half		Bottom Half			Top Half		Bottom Half		
No.	DBH	FELL	BROODS	COND	BROODS	COND	REMARKS	BROODS	COND	BROODS	COND	REMARKS
C1	11	SW	None	Dried	ML	Ba-L.	L on top where shaded	None	Dried	ML-P	50	Brood on top where shaded.
C2	8	SW	ML-P	Ba-Lo C-Mo.	ML-P	Ba-L.	Infested 11'.	ML-NA	35	ML-NA	35	Bark loose Cambium moist.
C3	8	SW	None	Dry	ML-P	Ba-L C-Mo	Log in open Infested 12'	None	Dry	-	-	Bark very loose and moist.
C4	12	S	-	Very few	ML-P	El- side	Lodged angle 45 degrees	P-NA	Few	ML-P	55-60	No attack on West.
C5	11	S	Few	Ba-Lo C-Mo	L-	Ba-Lo C-Vmo	Infested 12'	None		L-NA	30	Very wet. Doubt if they will mature
C6	12	SE	Few in shade	Dry	ML-P	Ba-Lo	Infested 28'	None	Dry	L-NA	30	B-L.C-VMo. Matur ing doubtful.
C7	10	S	None	Dry	ML-P	Ba-L.	Bark tighter toward stump.	None	Dry	L-NA	25	Larvae will not mature.
C8	10	SE	None	Dry	ML-P	Ba-L. C-Mo.	Infested 20'.	None	Dry	L-P	40	Not active. Maturing doubted.
C9	12	S	None	Dry	ML-P	Ba-L. C-Mo.	Inf.24'brood on bottom & sides	None	Dry	L-P	50	Pupa will mature Larvae will not.
C10	12	S	None	Dry	ML-P	Ba-L C-Mo.	Inf.20'brood on bottom & sides	None	Dry	P-NA	45	Covered with fin white mold. Will
C11	9	SE	ML-P	Ba-Lo C-Mo	ML-P	B-L. C-Mo.	Bole shaded	ML-P	25	ML-P	25	Bole shaded.
C12	10	SE	None		ML-P	Ba-L C-Mo.	Few insects on top	Few	Few	ML-NA	50-60	Insects active
C13	13	S	Few	Dry	ML-P	C-Mo. E-Si.	Larvae at bottom of log. Brood on top in shade	None	Dry	ML-NA	50	Cambium dry.Will all mature.
C14	12	EW	None	Dry T&S	L-P	Bottom	Sides dry	None	Dry T&S	ML-P	55-60	
C15	12	E	None	Dry T&S	ML-P	Ba-L. C-Mo.	Open exposure	None	Dry T&S	ML-NA	45-50	Cambium VM. May not mature.
C16	10	E	None	Dry T&S	ML-P	Ba-L. C-Mo	Top and Sides very dry	None	Dry T&S	ML-NA	55-60	Cambium VM. Larvae may not Matu re
C17	10	S	None	-	-	-	Pitched out	None	None	-	-	-
C18	11	E	None	Dry T&S	L-P		Few pupa on S side	None	Dry T&S	L-NA	30	C-VM Doubt if Brood will Mature
C19	8	SW	None	To Dry	ML-P	Bottom & sides	Ba-Lo. C-Mo. Dry on top.	None	To Dry	MP-NA	30-35	Insects on sides & bottom
C20	9	E	L	Few	L	Few	Light attack	None	Dry T&S	ML-P	20-25	North side.

TREE No.	DBH	BARK	JUNE 24, 1925 FOLIAGE	Woodpeckers WORK	STATUS of BROODS	Exp. Containing BROODS	REMARKS	JULY 2, 1925. STATUS of BROODS	Exp. Containing BROODS	Ins per sq. FT.	REMARKS
D1	14	M	G	-	ML-P	N.	G strip on S side. Few insects on S half	P-NA	N.E.S.W.	35	50% NA on N. Very few insects on South half
D2	18	M	S-Top R-Bot	xx	ML-P	N.E.S.W.	Very few on S½	NA	N.E.W.	35	Emergence holes on S.
D3	12	M	G	-	L-P	N.	Inf. 6'	NA	N.	15	Covered with white mold.
D4	13	M	G	-	ML-P	N.	Inf. 8'	P-NA	N.	25	Light attack
D5	11	M	G		L-P	N.	Light attack. Tree killed by Gi:	-	-	None	-
D6	16	T	G-Top S-Below	xxx	ML-P	N.E.S.W.	Missed by Wp.	NA	N.	20	Very dry.
D7	12	M	F		ML-P	N.E.S.W.	Light attack.	P-NA	N.	30	Light active brood.
D9	12	M	G-Top S-Bot.		ML-P	N.E.S.W.	Somewhat dry.	ML-P	N.E.S.W.	20	
D10	18	M	G		ML-P	N.E.S.W.	Inf. 24' Few ins: on S. sides.	ML-P	N.E.W.	55	Few on S.
D11	9	M-L	G-Top S-Bot		ML-P	N.E.S.W.	Tree in opening	New record made			
D12	15	M	G	xxx	ML-P	N.W.	Missed by Wp.	P-NA	N.W.	6-8	Scattered very dry.
D13	18	T	G-Top S-Bot	-	ML-P	N.E.S.W.	Heavy brood.	P-NA	N.E.S.W.	50	Emergence on S.
D14	8	T	S		ML-P	N.E.	Light attack.	ML-P	N.E.	25-30	Broke off at Girdle
D15	9	M	F		L	N.E.	S-W sides unattacked	ML-NA	N.E.	30	Broke off at Girdle
D16	10	M	F		ML-P	N.E.	Few on S-W sides:	ML-NA	N.E.	30	Few on W.None on S.
D17	12	M-T	G	xx	L-P	N.E.S.W.	Tree dry.	ML-NA	N.E.S.W.	40-45	Emergence on North.
D19	9	M	G		L	N	Very few. Emergence doubted.	No insects		None	
D20	10	M	S	x	L	N	Light attack	NA	N.	45	Emergence started.
D21	11	M	G-Top S-Bot		ML-P	N.E.S.W.	Few on S.	NA	N.	30	Light attack.
D8	10	M-L	Top of log dry but with few insects: Heavy brood on bottom sides.				Broke off at girdle. Ba-L. C-Mo. on bottom	Brood of 45 ML-NA on bottom half of log. C-VM, Ba-L. Doubt if all broods will mature			
D18	9	T	Tree fell E.& W. Top of log dried out with no broods bottom ½ of bole has Ba.-L. C-Mo. and medium brood.					Less than 20 insects sq. ft. on bottom ½ of log.			